

DOCUMENT RESUME

ED 330 019

CS 507 421

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TITLE Learning To Reason via Instruction in Argumentation.
INSTITUTION Pittsburgh Univ., Pa. Learning Research and Development Center.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE 91
NOTE 41p.
AVAILABLE FROM James F. Voss, 634 Learning Research and Development Center, University of Pittsburgh, Pittsburgh, PA 15260.
PUB TYPE Viewpoints (Opinion/Position Papers, Essays, etc.) (120)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Critical Thinking; Epistemology; Higher Education; Inferences; Logic; Logical Thinking; *Persuasive Discourse; Secondary Education; Student Evaluation; Teaching Methods; *Thinking Skills
IDENTIFIERS Argumentation Theory; Informal Logic

ABSTRACT

This paper discusses argumentation and how instruction may facilitate an individual's skill in argumentation. The paper contends that argumentation, defined as the generation and evaluation of arguments is a fundamental tool of reasoning and that skill in argumentation is therefore basic to a person's ability to reason. The paper is divided into two sections. The first section considers the nature and evaluation of arguments and the relation of argumentation to reasoning, while the second section describes some findings on the quality of argumentation found among students and summarizes some initial work on argumentation instruction. The paper suggests that the following points covered should be addressed when teaching argumentation: (1) students need to acquire knowledge about the structure and nomenclature of arguments; (2) students need to know the purposes of argumentation; (3) students need to know the characteristics of a good argument; and (4) argumentation skills can be developed via writing. (TD)

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Instruction in Argumentation**

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**Learning to Reason via
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Learning to Reason via Instruction in Argumentation¹**James F. Voss and Mary L. Means****University of Pittsburgh**

This paper is concerned with argumentation and with how instruction may facilitate one's skill in argumentation. The basic assumption underlying the paper's contents is that argumentation, defined as the generation and evaluation of arguments, is a fundamental tool of reasoning and that skill in argumentation is therefore basic to a person's ability to reason. The paper is divided into two sections. The first considers the nature and evaluation of arguments and the relation of argumentation to reasoning while the second describes some findings on the quality of argumentation found among students and summarizes some initial work on argumentation instruction. Suggestions are also made regarding such instruction.

Arguments, Argumentation, and Reasoning**Argument Structure**

The term argument has been used in at least two ways. One involves a disagreement between two or more individuals while the other refers to a structure of discourse. Although the relation of these two uses raises some interesting questions (See, for example, Brockriede, 1977; O'Keefe, 1977; Perelman & Olbrechts-Tyteca 1969), the focus of the present paper is on the second usage.

Figure 1A presents a diagram of the basic components of an argument. As indicated, an argument consists

Insert Figure 1 about here

of a claim or conclusion and a supporting reason or premise. A claim is an assertion that is set forth as being true (Fisher, 1988), while the reason provides support for the truth or plausibility of the assertion.

Claims are sometimes stated without supporting reasons. This happens when a claim is self-evident, when it already has been generally accepted, or, in a classroom, when a teacher or a text makes an unsupported assertion. In this case, the implied support is that of authority.

There are of course different types of arguments (cf. Salmon, 1984), but this issue is considered here only to note that the present paper is concerned with arguments involving plausibility or "probable truth" rather than with arguments found in formal logic, that is, categorical, conditional, and disjunctive syllogisms. Thus, we are concerned in general with what Aristotle referred to as dialectic rather than analytic arguments (Aristotle, tr.Cooper, 1960) or what Perelman and Olbrechts-Tyteca (1969) referred to as quasi-arguments. For our purposes, the probabilistic arguments, following Voss, Perkins, and Segal (1991), will be called informal arguments.

One of the most common forms of informal arguments, a form used extensively in our research, is what Aristotle termed the enthymeme, the structure of which is shown in Figure 1A. For example, "A 55-mph speed limit should be made law in all states" may be a claim, supported by "A 55-mph speed limit (is an act that) reduces traffic fatalities." Enthymemes contain an implicit premise that relates the conclusion and supporting reason, in this case being "An act that reduces traffic fatalities should be made law in all states." This implicit premise is also essentially what Toulmin (1958) has referred to as a warrant. A similar argument structure is found in which an intention is stated and the argument provides a basis for satisfying the intention (Walton, 1990).

An important aspect of informal arguments is that they are found in virtually all academic disciplines as well as in everyday thinking. For example, the testing of a hypothesis via an experiment is essentially an argument in which the claim is that the experiment is a legitimate test of the particular hypothesis, supported by the "reason" that the experimental conditions, especially the independent and dependent variables, as well as the controls, provide the legitimate test. Meteorology suggests "x" should occur because conditions "y" and "z" are present, and the presence of these conditions usually is followed by "x." Even mathematical problem solving involves such arguments (cf. Schoenfeld, 1991), although mathematics per se is regarded as having a formal structure.

While informal arguments may be amply found in virtually any domain, the type of reasons that are regarded as providing support for a claim varies somewhat with subject matter. Sciences seek experimental "facts" for support, while social sciences, in many

cases not having experimental evidence, tend to rely upon support provided by verbal argument and by case examples. The idea that a primary cause of the American Civil War was economic, for example, may be supported by historical evidence (verbal argument focused upon events and their interpretation).

Argumentation Evaluation

An important issue is of course how informal arguments are evaluated. They are evaluated on the basis of soundness, which in turn has three components: 1) the acceptability of the reason; 2) the relevance or support for the claim provided by the reason; 3) the extent to which reasons supporting the contradiction of the claim, that is, counterarguments, have been taken into account (Angell, 1966; Salmon, 1984).

As previously stated, a claim is an assertion that is set forth as being true. The reason provided to support the claim is usually a fact or at least an assertion that is regarded as true by the person stating the argument. The criterion of reason acceptability thus involves the extent to which the stated reason is regarded as true or acceptable by the person evaluating the argument. A reason may be judged, for example, as unacceptable, somewhat acceptable, or highly acceptable. Moreover, if a person thought the reason was unacceptable, we would think that the argument would be judged as quite weak. However, if a reason is judged as highly acceptable, then the argument may be judged as being strong, provided the other criteria are also met. We have indeed found that with topics of social issues such as abortion and capital punishment, arguments were in fact judged as low in strength when the supporting reason was judged as

unacceptable, and that overall there was a correlation of about .50 between reason acceptability and judgments of argument strength (Voss, Schooler, Fincher-Kiefer, & Nye, 1989).

As implied by the previous discussion, the criterion of reason acceptability would be expected to vary with respect to the types of reasons regarded as acceptable. Thus, for the proposition, "Water freezes at 0°C," a reason, defined in terms of experimental support, can be readily obtained and would be highly acceptable. Phrased more generally, individuals usually try to provide a supportive reason that will have consensual acceptance, such as an experimentally supported fact, a statistical result, or at least an observation that may be generally held. At times individuals provide reasons from their personal experience, as "I support that position because I once knew a person who . . .," or, sometimes "truisms" are used to support a claim, as "Because haste makes waste." These last two types of reasons are of course generally not as acceptable as more consensually-based reasons. In matters of social issues, reason acceptability, we have found, is related to one's position regarding the claim (Voss, Schooler, Fincher-Keifer, & Ney, 1989). For example, consider the proposition, "Abortion should be illegal except in cases of incest or rape," supported by the reason "Abortion is the taking of a life." This reason is regarded as more acceptable by a person advocating a pro-life position than by a person advocating a pro-choice position, even when the reason is not presented with the claim.

The second criterion of argument strength is that the reason must indeed be relevant to the claim and provide support for the claim. While the statement "Water boils at 100°C." may be perfectly acceptable, its relevance to the claim "Oil floats on water" is nil. Like reason acceptability, judgments of the extent of support a reason provides for an argument vary considerably even though reasons may be "relevant." For example, for the claim that all states should have a 55-mph speed limit, the reason "A 55-mph speed limit reduces gasoline consumption" produced an argument judged as weaker than the argument having the supporting reason "A 55-mph speed limit reduces traffic fatalities." Thus, even though both reasons are quite acceptable, relevant, and have (not mentioned) statistical backing, the two arguments are judged as having different strength. The question of why these arguments are so judged is of considerable interest, but for present purposes let it only be noted that a person's beliefs, values, attitudes, affect, and knowledge can all play a role in judgments of argument strength (cf. Feather, 1965; Selltiz & Cook, 1966). Indeed, we have found (Voss, Schooler, Kennett, & Wolfe, 1990), as have a number of other investigators (e.g., Zammuner, 1987), that number of reasons generated and the rating of the strength of those reasons is also a function of belief. Again, differences of judgment in argument strength would be expected to occur primarily when there is not consensual agreement concerning the support provided by a particular reason. While social sciences would generally be expected to have more of this type of disagreement compared to natural and physical sciences, the latter of course are not

immune, especially when the issue involves "cutting edge" research on issues yet to be resolved.

The third criterion of soundness involves the extent to which reasons supporting the contradiction of the claim (counterarguments) are taken into account. Four points are made regarding this criterion. First, Figure 1B presents a diagram of a counterargument and, as shown, it consists of an argument that has as the claim the contradiction of the initial claim. Thus, although claims are generally thought to have supporting and opposing or contra (con) reasons, this is an oversimplification. A con reason is in fact a supportive reason, supporting the contradiction of the original claim.

Secondly, not accepting a reason is sometimes thought to be a counterargument. However, in the abortion example presented above, not accepting the supporting reason that abortion is the taking of a life or even providing evidence against the supporting reason does not constitute a counterargument. It only refers to not accepting the reason.

Thirdly, given the nature of counterarguments, con reasons should be more difficult to process than pro reasons. While the processing of a pro reason may be reasonably direct via the presumed claim-reason relationship, a con reason presumably involves the implicit processing of the relation of the con reason to its related claim (the contradiction of the original claim) and the processing of that claim in relation to the claim stated. Indeed, we have found that more pro than con reasons are typically generated, that reaction times involving whether a reason supports or opposes a previously presented claim are faster for supporting reasons, (Voss, Schooler, Kennett, & Wolfe, 1990), and

that pro reasons yield judgments of greater argument strength than con reasons (Voss, Schooler, Fincher-Kiefer, & Nye, 1989).

With respect to the fourth point regarding counterarguments, our data suggest that individuals generally do not think of counterarguments unless the counterarguments are explicitly presented or the individual is asked to think of them. This lack of stating counterarguments perhaps may not hold when a person is in a heated disagreement, but in tasks involving argument evaluation in which a claim and a reason are presented, individuals apparently restrict their evaluation to the argument as provided. On the other hand, our findings also indicate that presence of a counterargument does influence argument evaluation. When a weak opposing reason is presented with a strong argument, judgments of the strength of the strong argument significantly decrease, and when a strong counterargument is presented with a strong argument, the strength judgments of the strong argument show a further significant decrease. When the argument judged is a weak argument and it is presented in the presence of a weak counterargument, the judged strength of the weak argument increases. Thus, a weak argument is perceived to be stronger in the presence of a weak counterargument (what we have referred to as the "faculty meeting effect"). When a weak argument is evaluated in the presence of a strong counterargument, there is a decrease in the judged strength of the weak argument (Voss, Schooler, Fincher-Kiefer, & Nye, 1989).

Thus, with respect to the evaluation of informal arguments, we have demonstrated that indeed each of three criteria of soundness that have been presumed to influence the

judged strength of arguments do in fact have that effect. But in addition, we have found that belief plays a substantial role in such judgments. Belief apparently acts as a weighting factor, with argument strength judged as stronger or weaker as a function of the individual's respective agreement or disagreement with the claim. This is not to say, however, that if one disagrees with the claim the argument is necessarily rated as having weak strength. Instead, the weighting attributable to a belief tends to be constant regardless of whether the argument is strong or weak or, phrased another way, regardless of whether an argument is strong or weak, there is an approximately constant difference in judged argument strength between those who agree with the claim and those who disagree with it.

As previously noted, the role of belief would be expected to vary with subject matter domain. Thus, in physical and natural sciences, the role of belief would usually be minimal because much of the subject matter is consensually agreed upon via experimental support. However, scientists speaking on the "greenhouse effect" and "global warming" as well as on other similar issues for which empirical results are non-existent or inconclusive may readily judge evidence in relation to their beliefs. On the other hand, in social sciences and especially in the area of social issues, claims based upon data are fewer and the opportunity for the role of the belief factor in evaluation is generally substantial.

Reasoning and Argumentation

We assume that reasoning is a mental process that usually takes place via the use of argument, or, more strongly, argument structure is viewed as the form of discourse by which reasoning usually takes place, a type of syntax for reasoning.

We offer the following rationale to support this assertion. Reasoning is typically defined as an inferential process by which a person, beginning with some given information or premise(s), makes an inference that enables that individual to reach a conclusion or provide some new (inferred) information that was not given (e.g., Halpern, 1984). However, the inference does not stand by itself. It requires justification, the justification consisting of what permits the individual to go from premise to the conclusion. The justification may of course be in the form of a premise, as one typically finds in deductive reasoning. But reasoning also involves generating support for a claim, or providing reasons for a conclusion, and in this case also, the support requires justification. Indeed, this type of reasoning is somewhat difficult to classify, for it is not strictly deduction or induction (Wellman, 1970). Nevertheless, at the core of reasoning, as it is described here, is an argument structure. Furthermore, even in evaluating the products of reasoning, the arguments, argumentation is involved, because a person may state "I disagree with that argument (claim) because-- (reason).

That argumentation is at the core of reasoning in various subject matter domains may be readily demonstrated. For example, when proving a theorem in geometry, each step consists of moving from a given state to another state, the step being justified by some previously proved proposition. Or, consider the proposition, "If the temperature falls

below 0°C., water will freeze." Justification comes from experimental support. Or, reasoning may involve stating an argument such as "Because handgun control laws would reduce the crime rate, such laws should be passed in the United States." Or, reasoning may involve deliberation, in which case an individual may make what have been termed projective inferences, that is, inferences involving possible consequences of actions (Walton, 1990). Thus, given that a person wants to purchase a new automobile, she may say "I want to purchase a car that is inexpensive to run and which will last a long time." "I will purchase a Honda Civic because a Honda Civic is inexpensive and will last a long time." Thus, the argument structure is critical to reasoning in subject matter ranging from math and science, to social science, and to everyday or practical reasoning.

Given that argumentation is such a fundamental component to reasoning, it is perhaps surprising that it has received so little attention from psychologists. Indeed, most of the research conducted on reasoning, until recently, has employed the structures of formal logic such as the categorical syllogism, the conditional syllogism, and the disjunctive syllogism, addressing the question of whether individual performance conforms to the rules of the particular syllogism, and if it does not, then the question of why the discrepancy occurs is usually addressed. Furthermore, implicit in much of this work as well as explicit in some studies is the question of rationality; humans are regarded as rational if they followed the rules of the logic and not rational if they did not. Henle's (1962) paper is often cited in this regard, essentially holding that humans are rational and

that errors made can be attributed to mistakes of interpretation such as assuming that "All A are B" also means "All B are A." But while formal argument structures are of course arguments, and while research involving their use is of importance, they nevertheless are used only infrequently in human activities. Most arguments in human discourse are probabilistic, dealing with probable truth and plausibility.

In recent years, however, there has been an increasing interest in informal reasoning (See Voss, Perkins, & Segal, 1991). Research on informal reasoning is generally concerned with how individuals reason when the subject matter they are dealing with involves probable truth, plausibility, or opinion, subject matter including not only academic domains but everyday situations. Furthermore, there has been a substantial increase in interest in informal logic (e.g., Johnson & Blair, 1980) and in rhetoric. The rhetorical movement and its concern with argumentation was marked by the publication of works such as Toulmin's The Uses of Argument (1958) and Perelman and Olbrechts-Tyteca The New Rhetoric (1969). The work has included a few experimental studies (e.g., Hamble, 1978) as well as consideration of the knotty question of what constitutes a good argument (Booth, 1974, 1979; Fisher, 1980). In addition, some writers have been concerned with how to extract complex arguments from discourse and evaluate such arguments (e.g., Fisher, 1988).

As noted in the first paragraph of this paper, given our assumption that argumentation lies at the core of reasoning, it would follow that instruction in argumentation and the development of a student's skill in argumentation should be a

fundamental aspect of schooling. The next section of this paper briefly describes results related to this issue and presents some suggestions regarding instruction in argumentation.

Argumentation: Research and Instruction

General Research Findings

We have conducted two developmental studies involving children at the junior and senior high school levels (ages of approximately 12 to 17). In this work, the major tasks have focused on asking the students to generate and/or evaluate arguments or argument components. Our findings have indicated that children vary considerably with respect to reasoning ability. From this and other research (e.g., Nickerson, Perkins, & Smith, 1985; Perkins, Allen, & Hafner, 1983), we have developed a characterization of what constitutes skilled reasoning and correspondingly what constitutes less skilled reasoning. Table 1 presents a summary of this characterization.

Insert Table 1 about here

Research findings from our laboratory have indicated that skilled reasoners actively participate in the problem at hand by analyzing the argument. For example, when asked to generate reasons in support of or in opposition to a given claim such as "Alcohol use is beneficial to your health," skilled reasoners often do not passively accept the claim as stated, but instead tend to actively reframe or "unpack" the argument by generating

statements such as, "Well, it depends on whether your talking about mental or physical health." In other words, they do not appear satisfied with the claim as stated, and they engage in a process of conversion via the use of the qualifier "It depends." Active participation is also manifested in the spontaneous generation of counterarguments, as well as in the spontaneous monitoring of their progress as their argument unfolds, a metacognitive function.

The characteristic of flexibility has also been observed in skilled reasoners. Thus, while the most common type of reason generated is one of consequence, as, "Alcohol is not beneficial because it causes liver problems," skilled reasoners are adept at generating arguments by analogy, by definition, and past precedent as well. Flexibility is also demonstrated in that skilled reasoners are more able than less skilled to generate reasons that are in opposition to their viewpoint. Thus, even if they are initially in strong agreement with a stated claim, they are nevertheless more capable of suspending their position and generating opposing arguments. On the other hand, findings related to less skilled reasoners indicate that such reasoners are characteristically more passive and less flexible in their performance. They rarely "reframe" the initial claim and generate significantly fewer reasons in support of the stated claim, with these reasons more often being characterized as vague and/or personal as compared to their more skillful counterparts. In addition, less skilled reasoners are more likely to misinterpret and/or distort information in the given claim and generate reasons that are unacceptable and/or

irrelevant with respect to the stated claim, (a result also reported by Voss, Blais, Means, Greene, & Ahwesh, 1986).

In addition, skilled reasoners provide multiple reasons in support of their claims, and in doing so, use a number of abstract types of reasons such as reasoning by consequence, by definition, and other forms, these and other forms having been noted in Aristotle's topoi (Aristotle, trans. Cooper, 1960). In addition, skilled reasoners use qualifiers more than unskilled reasoners, that is, statements that conditionalize arguments with respect to when they are appropriate. Finally, skilled reasoners are also better able to use and refute counterarguments when appropriate.

An Expert Reasoner

In an effort to examine more directly how reasoning and argumentation skills may be utilized in the classroom, we asked a college freshman to participate in a "think aloud" experiment in which he was asked a series of questions regarding his expository writing habits. This person, whom we will call Joe, had already participated as a gifted senior in a reasoning study we previously conducted at his high school. His performance in our reasoning study was highly superior across all measures. Joe, for example, generated 22 reasons in support of the four claims we presented, whereas the average number generated in his grade for the claims was 11.5.

The majority of the questions posed to Joe in our study related to how he would go about developing a paper if he were presented with a vague open-ended topic such as "earthquakes." In general what is striking about our expert's protocol is that much of

his initial pre-writing effort involved the utilization of argumentation skills. Indeed the central goal for Joe was to initially move from topic to thesis by developing a claim about earthquakes. The initial claim that Joe invented was relatively general and took the form of a research question, namely, "Could earthquakes be controlled by exploding small nuclear devices in a fault? Would that have any effect on the occurrence of earthquakes?"

Joe's protocol suggested that his movement from the topic to the working thesis or claim was a result of active search processes coupled with criteria knowledge. Joe related that he initially lets the topic "roll around in his head" for awhile, and that during this time he activates relevant knowledge and "looks" for something interesting to write about and, interestingly, when he thinks of what may be a good issue he senses a feeling of elation. The research question Joe selects is not random, but seems to result from the application of several criteria. Joe, for example, rejected the commonplace and avoided issues about which much had been written. He is drawn instead toward bizarre linkages and obscure and/or uncommon ideas, especially those for which he has little knowledge.

The development of a research "question" is critical to Joe because it establishes the basis for the next pre-writing step, which is the development of an argument structure consisting of reasons in support of or in opposition to the initial claim. In this stage, Joe amended his initial research question from "Could earthquakes be controlled?" to "Would it help to deter or control an earthquake or would it cause an earthquake if . . ." Thus the question was refined and expanded, but more importantly, Joe began to generate

"hypothetical" reasons for why the implantation of nuclear devices would either deter or cause an earthquake. Thus, the claim is "unpacked" and the reasons unfold. Joe, for example, generated hypothetical reasons such as "by doing this (releasing nuclear devices) on a small level, fairly frequently, it would release the built up tension in the fault line so it would periodically avert a disastrous scale earthquake and just have small ones. . . tremors. . . four or five."

A notable aspect of this protocol is that Joe developed an abstract argument structure mentally before he conducted any formal research and well before he began to write. This argument template allowed him, in turn, to be goal directed as he began the next step, in which he stated "Now I'd probably start bringing in the factual information (via a library research) and once I found or very likely did not find proof of these reasons, or if I found additional reasons, then I'd probably go back and revise what I've done through step one . . ." Joe thus viewed this structure as malleable, as something he can deviate from and change substantially if necessary. Thus, while the structure is critical in that it directs the search, at the same time it is expendable.

According to Joe, the library search would aid him in "collating and interrelating" the information. Factual information would lead to the acceptance or rejection of hypothetical reasons already generated or the generation of new reasons. When asked what type of thesis might evolve from his amended research question, Joe generated the following: "It is possible to prevent earthquakes in Southern California and safeguard nuclear power plants by using the atom itself to defuse fault tensions." What is

interesting about this form of the claim or thesis is that it represents only the 'deter' side of the argument structure he initially created. This deviation suggests Joe was not necessarily bound by his initial structures but rather that they, by the form they take, may offer him multiple options, even in the final prewriting stages of his work.

In summary, the above protocol is noteworthy for two reasons. One is that it is of theoretical relevance because the thinking activities outlined by Joe parallel many of those we have observed in our laboratory experiments involving skilled reasoners. Joe is active and goal directed. His actions are centered around developing a sophisticated argument structure. He operates in an exceedingly flexible and self-regulatory manner. In addition, the commentary of Joe is of instructional relevance because it points to the fact that the development of argument structures is a vital and fundamental step in common classroom activities such as expository writing.

Why Teach Argumentation?

Thus far, we have considered a number of issues pertaining to the nature of argumentation and its relation to reasoning. We now turn to the instructional arena and specifically to a discussion of the potential benefits associated with the teaching of argumentation. In this regard, we would argue that the teaching of argumentation is of potential benefit because it both will enhance the development of reasoning skills and also aid in the acquisition of subject matter. We will address these issues in turn.

Earlier in this paper, we suggested that argumentation represents a discourse conduit through which reasoning flows. Given this assumption, there are three reasons

why it is important to encourage the development of informal reasoning. First, our research findings suggest, as other investigators have also observed, that school age children, in general, lack proficiency in reasoning skills (Perkins, 1984; Resnick & Resnick, in press). Second, informal reasoning is an integral part of education, a skill which is used widely across a number of subject domains. Finally, our examination of a number of programs designed to provide instruction in "critical thinking" and related skills, whether experiencing reasonable success or the lack thereof, quite generally lack a systematic theoretical framework (see for example Segal, Chipman & Glaser, 1985). Instead, the majority of programs, with the exception of those such as the Philosophy for Children Program designed by Lipman, consist of an enumeration of presumed skills with the intention of designing means to develop those skills via instructional channels. Our view is that a form of instruction that encourages informal reasoning development via instruction in argumentation can provide a coherent theoretical framework as well as a program that is based upon that framework.

With respect to the learning of subject matter, it is quite conceivable that instruction in argumentation will produce a better understanding of arguments as they are found in particular subject matter domains, whether the arguments are stated in a text or in a teacher's exposition. Furthermore, we would hypothesize that acquiring knowledge about argumentation would also facilitate the acquisition of skills such as reading and writing, skills that cut across various subject matter domains. Also, in learning about argumentation, students would likely be able to enhance their skill in evaluating such

argumentation. Instruction in argumentation should also facilitate a student's ability to organize subject matter. An argument template such as a thesis paired with reasons constitutes a type of skeletal structure onto which information can be attached, and in general, this should enhance the likelihood that the information can be used in a flexible manner. Finally, the student may via argumentation develop the ability to "play with" information, a potentially important instructional goal because it can enhance student understanding and application of subject matter.

Argumentation: What to Teach

Knowledge about the processes and products of successful reasoners coupled with knowledge about the maladaptive processes and unacceptable products of less successful reasoners offers instructional guidance with regard to "what to teach" (cf. Brown, Bransford, Ferrara, & Campione, 1983). Children need to acquire knowledge about the "domain of reasoning", reasoning as subject matter, and that, according to the previously described presumed relation of reasoning and argumentation, instruction in reasoning should focus upon argument structures and how they are used. More specifically, instruction is required about the defining characteristics of argument components, claims and reasons, as well as components such as counterarguments and qualifiers. We would also urge that such instruction be directed toward the teaching of more sophisticated critical knowledge such as what constitutes a "good" claim, or a "good" argument, and concomitantly what constitutes an unacceptable and/or unsound

argument or reason. In addition, the development of the skill to critically analyze arguments we regard as highly important.

Although we are advocating the teaching of argumentation per se, we are not advocating that a course such as "Reasoning via argumentation" should be offered, a course that would have as its basic assumption the idea that if a student learns about argumentation, reasoning in all subject matter will immediately improve. What we do suggest, however, is that instruction in argumentation be coordinated with learning in a particular subject matter domain, and our hypothesis is that such instruction will then permit the student to use argumentation as a tool in relation to at least that particular subject matter.

Over the past year one investigator of our laboratory has been working informally with a team of ninth grade history teachers in an effort to enhance the development of reasoning skills in the classroom. What follows constitutes a preliminary report pertaining to the teaching of argumentation skills to students in this World Civilization History class. The teaching of argumentation in this context took place via a combination of formal lecture and of course-driven writing accompanied by pre-writing assignments. Below is presented a series of suggestions regarding instruction in argumentation that are based upon the experience in this relatively informal instructional setting.

1. Students need to acquire knowledge about the structure and nomenclature of arguments. As just noted, in order for students to acquire knowledge about argumentation, it is important that they become familiar with terms such as

argument, counterargument, claim or thesis, reason, and qualifier. Students need to know that an argument contains both a conclusion or claim and at least one reason in support of that claim. Although reasons are fundamental to argumentation, there nevertheless are students we have worked with that have difficulty isolating, even from their own written work, the reasons that support their theses. We have also experienced students who were unaware that they have included reasons in their own written work that support the contradiction of their thesis! In this regard, it is particularly useful for students to become informed regarding characteristics of reasons. One way to do this is by providing instruction in various ways in which reasons may be categorized such as: 1) Supporting or opposing (pro or con), 2) Acceptable or unacceptable, 3) Factual/non-factual, and 4) Specific instances of one type of Aristotlean topoi.

First, and we believe this is basic, students need to know that pro reasons support the thesis and con reasons oppose the thesis (or support the contradiction of your thesis). While this may be obvious, it apparently is not always clear to students. In addition, students need to be able to apply this knowledge in developing an argument. For example, if the task is to write a "position" paper, then pro or con reasons are appropriate, but not both, unless one wishes to refute the opposing position. If the task is to evaluate a particular position then stating and weighing both pro and con reasons is reasonable.

A second major characteristic of reasons relates to their acceptability or plausibility per se and to their relevance or support for the claim. Given the frequency with which

some students generate unacceptable reasons, it would be instructive for students to know about criteria associated with reason acceptability and relevance. Thus, unacceptable or unsound reasons are those which 1) do not have truth-value or 2) do not support the given thesis. However, reasons that are overly vague and/or too general are also of low acceptability. In our research, we have found that students, especially less-skilled reasoners, often cannot distinguish between acceptable and unacceptable reasons when asked to do so. Thus, we regard experience in judging reason acceptability and reason relevance to be a potentially helpful exercise. Furthermore, and quite importantly, students should to be able to tell why a given reason is acceptable.

Another dimension along which reasons may be classified is whether they are factual or non-factual. Factual reasons contain empirical or statistical data. Non-factual reasons contain abstract and/or hypothetical information, or are matters of opinion. As an example, for the claim "People should not smoke," a factual reason is "Because smoking causes cancer," while a non-factual reason is "Because smoking can interfere with rights of others." We have found that less skilled reasoners rarely generate non-factual reasons of this type. It would be instructive for students to be able to distinguish these types of reasons and know that, in most cases, fully acceptable reasons may be either factual or non-factual and that, in some cases, non-factual reasons may even be more appropriate and powerful than factual.

Finally, reasons can also be classified into specific types. Aristotle, in his book The Rhetoric (trans. Cooper, 1960), enumerated approximately 26 lines of argument or types

of reasons people can use in support of their thesis. Among these are included reasoning by or argument from consequence, comparison, definition, authority, and past precedent. Our research findings (Voss, Schooler, Kennet & Wolfe, 1990) have shown that argument by consequence is the type most frequently generated by students. However, our findings have also shown that one characteristic that is most striking among successful reasoners is that their arguments frequently contain a variety of different types of reasons.

There are at least two major advantages associated with teaching students some of the types of argument found in classical rhetoric and their application. One is that when students have at their disposal (in hand-out form, for example) a list of such classes of reasons, the list functions "as a suggestor or prompter, or as a checklist of ideas on some subject" (Corbett, 1971). Thus, when students are "stuck" or unable to generate reasons, accessing a list of types of reasons may facilitate the production of additional arguments, the list serving as a cue that is used to search mentally for additional information pertaining to the issue at hand. Secondly, the use of different reasons adds variability and richness to the overall argument and for the most part, functions to strengthen the case one is building.

Useful approaches and/or exercises that we have employed in the classroom in an effort to teach reasoning nomenclature have included: 1) Teaching nomenclature in the context of a particular lecture or reading assignment. For example, "According to your textbook, what factors or reasons contributed to the growth of agriculture in the

ancient world?" 2) Distributing hand-outs offering explicit definitions and examples of reasoning components. Given the paucity of knowledge students have about such concepts and given that note-taking skills are sub par for many students, hand-outs have been helpful. 3) Asking students initially to write down the definitions of cogent terms. From the standpoint of prior knowledge, it is useful for teachers to know something about what misconceptions the students may have with regard to the terms. 4) Conducting in class course-driven exercises in which students are asked to generate and/or recognize various types of reasons.

2. Students need to know the purposes of argumentation. In working in the classroom, we have found that both students and teachers often fail to understand, and in the latter case also may fail to clarify, the relationship between the argument structure and the assignment. Thus, the purpose of a social studies paper for example may be to: 1) defend or refute an existing position, 2) present the pros and cons of an existing position, 3) critical evaluate one or both sides of an issue, 4) support and/or develop one's own position, 5) to reach a new, modified position, 6) to solve an existing problem, 7) to make a decision, or 8) to persuade. It is informative for teachers and students alike to know that "different" assignments call for "different" types of argument structures and also to know what form such argument structures may assume. For example, a rather straightforward assignment consists of the defense of a position that calls for the generation of pro reasons in support of an existing thesis. It would, moreover, probably

be pedagogically advantageous to start with assignments involving structural simplicity and to proceed to more difficult structures after mastering the less complicated forms.

3. Students need to know the characteristics of a good argument. As indicated in Table 1, better reasoners, in providing well-formed arguments, are more proficient with respect to generating a number of argument characteristics. Having some knowledge about what constitutes "a well-developed" argument represents a powerful tool in that such knowledge can be used both as a means of generating argument components as well as a yardstick against which to measure or evaluate a finished product. Instruction providing examples or models of good arguments can be helpful in this regard.

4. Enhancing argumentation skill via writing. We have found that writing a history paper represents an assignment for which many students feel inadequate and unprepared. Our view is that the chore of paper writing can be simplified and made less aversive if such a task is broken down into a set of goal-directed activities aimed at the building of a well-developed argument. The following steps may be regarded as basic: 1) the development of a thesis, 2) the generation and evaluation of reasons that can be used to support that thesis, 3) the strengthening of such reasons, and 4) the grouping of these reasons into categories. These steps are now considered.

a) Developing a thesis. In writing assignments, students are usually either presented with a thesis and asked to do something with it, (as defend), or they are asked to develop a thesis and subsequently defend and/or evaluate it. Our findings suggest that

when presented with a thesis, skilled reasoners frequently "interpret" it before they begin providing evidence for or against it, even though they have not been asked to do so. Thus, when asked to support the claim "Marijuana should be legalized," one may state "Well, it depends on whether it's going to be used for medical or social purposes..." Interpreting key elements or key extensions of the thesis, as "legalize for whom" or "for what purpose," is beneficial in that it potentially allows the reasoner to expand the number of reasons generated and/or to qualify the conditions under which the reasons apply. Thesis "interpretation" is thus a valuable skill for students to acquire.

The task of "developing" a thesis appears to be a difficult undertaking for students across all grades. Problems associated with thesis development include the following:

- 1) Students have difficulty because they have a "topic" but not a thesis. Students need to become acquainted with the fact that often thesis development initially involves converting a topic into a thesis that can be defined as a single declarative sentence and asserts or denies something about the subject or subject matter (Corbett, 1971).
- 2) Students fail to take into account or understand the goal of the assignment, and sometimes the goal has not been specified. Also, once a student develops a thesis, he/she may run into difficulty because it is too broad, too complex, too vague, too lengthy, or not in declarative form. Again, students would benefit not only by having at hand some criteria information about what constitutes a "good" thesis but may also benefit by having information about what constitutes a "poor" thesis.
- 3) In developing a thesis, students often fail to revise it. It is sometimes helpful for students to view their initial thesis as a

"working" thesis that may be subject to further specification and/or revision as the paper unfolds.

b) Generating and evaluating reasons. Once a student has developed a thesis, his/her major task likely becomes that of defending it. And, in order to produce a well-developed argument, the task becomes one of generating a number of valid reasons in support of the thesis. As previously mentioned, knowledge pertaining to the various ways in which reasons can be classified, may, in and of itself, 'prompt' a student to generate a sufficient number of reasons. In terms of evaluating such reasons, knowledge pertaining to acceptability criteria should help the student determine whether the reasons he has generated are appropriate and/or acceptable.

An instructional tool that we have used with some success in the classroom consists of a Reason Classification Chart. In such a chart, students are asked to list their reasons and indicate whether each is pro or con and factual or non-factual. In addition, the student is to classify it with respect to argument type, as previously discussed, and indicate whether it may be regarded as acceptable or unacceptable and why. The chart is thus designed to help students generate and evaluate reasons. When used as a pre-writing tool, it is also of value in that it tends to inhibit students from engaging in what only can be described as a tendency to "write in flight," or write in a hurried fashion without necessarily having any direction or content matter in mind. It also functions as a powerful organizing tool and helps students to realize that some of the reasons they produce are

simply repetitions of reasons already generated or not reasons but other argument components such as qualifiers and elaborations.

c) Strengthening the reasons. As noted, our research findings indicate that less skilled reasoners generate a greater proportion of vague reasons than skilled reasoners. Moreover, less skilled reasoners often fail to qualify or elaborate the reasons they generate. We would suggest that there are at least three ways in which reasons can be strengthened. One is by increasing the specificity of the reason. For example, one could convert the reason, "because it causes problems in your body" to "because it can cause damage to the liver," if you were supporting the claim "Alcohol is not beneficial to your health." Reasons can also be strengthened via the use of qualifications and elaborations. Assume the thesis is "Smoking is not beneficial to your health," and suppose the reason provided is "Because it causes lung cancer." This reason in turn can be strengthened by the addition of a qualifying statement such as "Because it causes lung cancer, especially among those who are chronic heavy smokers and eighty percent of lung cancer cases are attributed to cigarette smoking." Thus, a given reason can be strengthened by the addition of various qualifiers and backing in that such statements add more detail, truth-value, richness and believability to the base being made.

d) Grouping reasons. Highly skilled reasoners are distinct from their counterparts in that when asked to provide evidence in support of a claim, they tend to reason hierarchically, in the sense that they are able to place reasons in category form. For example, a skilled reasoner may say, "Well, there are some economic reasons I can

think of for why marijuana should be legalized but there are also a lot of social and health reasons for why marijuana should not be legalized." While this grouping tendency occurs only occasionally in the oral mode, the tendency may be more prevalent in the written mode, in which case students have a greater opportunity to reflect upon the development of their argument.

The grouping of reasons into categories can function as an organizing tool for the reasoner and may help the reasoner become aware of potentially weak areas of his argument, as in the case where the reasoner may discover that five 'social' reasons may have been stated but only one economic reason. Also, from the perspective of paper writing, the grouping and subsequent placement of such categories of reasons in the section of text immediately following the thesis statement functions as an advanced organizer for the reader, in that the reader is aware, at the outset, of what general types of evidence the author intends to use to build his case.

e) Providing argument in a social context. As Perelman and Olbrechts-Tyteca (1969) point out, a person's generation of an argument is a social act. The development of an argument always takes place in the context of an audience, explicitly or implicitly. The audience may of course be hypothetical or, to the student, it may be the teacher and "what the teacher wants." But the idea that argumentation should occur in social context has a more concrete ramification. When students are able to generate arguments that have a target audience, whether a teacher or other students will evaluate the paper, the student may experience the need to provide his or her own evaluation prior

to having the work criticized. This act may in turn enhance one's skill evaluating arguments, including those generated by one's self.

Concluding Remarks

We do not mean to leave the impression that the teaching of argumentation is a panacea for learning and the development of reasoning skill. Moreover, the art of becoming skillful in the use of argumentation requires knowledge not only of argumentation per se but also requires knowledge of particular subject matter domains with much knowledge being accessed and utilized in an argumentation context. Indeed, even Aristotle, in his work on rhetoric, emphasized the importance of knowledge, and along with Plato was skeptical of Sophists who tried to persuade without having appropriate knowledge. Indeed, in a modern setting, we find by comparison much political oratory, for example, is based upon mechanisms of persuasion with minimal sound argumentation. Indeed, the "30-second bite" on television is often aimed at thoughtless persuasion. In this context it is interesting to speculate whether a greater skill in argumentation on the part of the electorate would move political oratory to a higher plane. Even though this may be wishful thinking, we want to note that, as Aristotle pointed out, argument is the best way to arrive at probable truth. At the same time Aristotle (tr. Cooper, 1960) described a large number of argument types what arguments are best to use in particular circumstances. Similarly we would hope that training in argumentation with the goal of arriving at probable truth may help people evaluate what constitutes probable truth in a variety of circumstances.

In this paper we have argued that arguments are at the core of reasoning and that instruction in argumentation is therefore a critical aspect in the improvement of reasoning skill. We have suggested some ways in which such instruction may be provided. We do not mean to imply that these ways are new. Indeed, if anything they are a poor imitation of instruction in argumentation provided in Greek and Roman times. They are meant only to indicate that, based upon our experience, knowledge of and the ability to use argumentation are not possessed by many students, and that instruction in argumentation should not only enhance reasoning skill but also facilitate learning.

References

- Angell, R. B. (1964). *Reasoning and logic*. New York: Appleton-Century-Crofts.
- Aristotle (1960). *Rhetoric*. (Trans. Cooper). Appleton-Century-Crofts.
- Booth, W. C. (1974). *Modern dogma and the rhetoric of assent*. Notre Dame: University of Notre Dame Press.
- Booth, W. C. (1979). *Critical understanding: The powers and limits of pluralism*. Chicago: University of Chicago Press.
- Brockriede, W. (1977). Characteristics of arguments and arguing. *Journal of the American Forensic Association*, 13, 129-132.
- Brown, A. L., Bransford, J. D., Ferrara, R. A., Campione, J. C. (1983). Learning, remembering, and understanding. In J. H. Flavell and E. M. Markman (Eds.), *Carmichael's Manual of Child Psychology*. (Vol. II). New York: Wiley and Sons.
- Corbett, E. P. J. (1971). *Classical rhetoric for the modern students*. New York: Oxford University Press.
- Feather, N. T. (1965). Acceptance and rejection of arguments in relation to attitude strength, critical ability, and intolerance of inconsistency. *Journal of Abnormal and Social Psychology*, 69, 127-136.
- Fisher, A. (1988). *The Logic of Real Arguments*. Cambridge: Cambridge University Press.
- Fisher, W. R. (1980). Rationality and the logic of good reasons. *Philosophy and Rhetoric*, 13, 121-130.
- Halpern, D. F. (1984). *Thought and Knowledge*. Hillsdale, N. J.: Erlbaum.
- Hample, D. (1978). Predicting immediate belief change and adherence to argument claims. *Communication Monographs*, 45, 219-228.
- Henle, M. (1962). On the relation between logic and thinking. *Psychological Review*, 69, 366-378.

- Johnson, R. H., & Blair, J. A. (1980). The recent development of informal logic. Blair, J. A. & Johnson, R. H. (Eds.), *Informal Logic: The First International Symposium*. Inverness, CA: Edgepress. Pp. 3-28.
- Nickerson, R. S., Perkins, D. N., & Smith, E. E. (1985). *The Teaching of Thinking*, Hillsdale, N. J.: Erlbaum.
- O'Keefe, D. J. (1977). Two concepts of argument. *Journal of the American Forensic Association*, 13, 121-128.
- Perelman, C. & Olbrechts-Tyteca, L. (1969). *New Rhetoric: A Treatise on Argument*. Notre Dame, IN: University of Notre Dame Press.
- Perkins, D. N. (1984). The nature of shortcomings in every day reasoning. Unpublished manuscript.
- Perkins, D. N., Allen, R., & Hafner, J. (1983). Difficulties in everyday reasoning. Thinking: The expanding frontier. In W. Maxwell (Ed.), Philadelphia, PA: Franklin Institute Press.
- Resnick, L. B. & Resnick, D. P. (in press). Assessing the thinking curriculum: New tool for educational reform. In B. R. Gifford and M. C. O'Connor (Eds.), *Future assessments: Changing views in aptitude, achievement, and instruction*. Boston: Kluwer. Academic Publishers.
- Salmon, M. H. (1984). *Logic and critical thinking*. Orlando, Florida: Harcourt Brace Jovanovich, Publishers.
- Schoenfeld, A. H. (1991). On mathematics as sense-making: an informal attack on the unfortunate divorce of formal and informal mathematics. In J. F. Voss, D. N. Perkins, and J. W. Segal (Eds.), *Informal Reasoning and Education*. Hillsdale, N.J.: Erlbaum. Pp. ____.
- Segal, J. W., Chipman, S. F., & Glaser, R. (1985). *Thinking and learning skills* (vol. 1). Hillsdale, N. J.: Earlbaum.
- Selltiz, C. & Cook, S. W. (1966). Racial attitude as a determinant of judgments of plausibility. *Journal of Social Psychology*, 70, 139-147.
- Toulmin, S. (1958). *The uses of argument*. New York: Cambridge University Press.

- Voss, J. F., Blais, J., Means, M. L., Greene, T. R., & Ahwesh, E. (1986). Informal reasoning and subject matter knowledge in the solving of economics problems by naive and novice individuals. *Cognition and Instruction*, 3, 269-302.
- Voss, J. F., Perkins, D. N., & Segal, J. W. (Eds.) (1991). Informal reasoning and education. Hillsdale, N. J. & Erlbaum.
- Voss, J. F., Schooler, T., Fincher-Kiefer, R., & Nye, L. (1989). On the evaluation of arguments. Paper presented at meeting of Psychonomics Society, Atlanta, GA.
- Voss, J. F., Schooler, T., Kennett, J., & Wolfe, C. (1990). Argument structures and argument generation. Paper presented at Psychonomic Society, New Orleans, LA.
- Walton, D. N. (1990). *Practical Reasoning*. Savage, Md.: Rowman & Littlefield.
- Wellman, C. (1970). *Challenge and Response: Justification in Ethics*. Carbondale, Illinois: Southern Illinois University Press.
- Zammuner, V. L. (1987). For or against: The expression of attitudes in discourse. *Text*, 7, 411-434.

Argument

Counterargument



C = Claim

R = Reason

$\overline{C}$ = Contradiction of C

Fig. 1. Diagram of an argument and a counterargument.

Table 1

<u>Characteristics of Skilled Reasoners</u>	<u>Characteristics of Less-skilled Reasoners</u>
Active, flexible	Passive, rigid
Restrictive thesis	Do not restructure thesis
Generate arguments that have multiple and varied reasons qualifiers counterarguments and the refutations	Generate arguments that have few reasons a lack of qualifiers a lack of counter arguments
Employ metacognitive mechanisms such as evaluating and monitoring	Do not employ metacognitive mechanisms as evaluating and monitoring

Footnotes

¹ The research reported in this paper was supported by the Office of Educational Research and Improvement of the United States Department of Education, via an award to the Learning Research and Development Center of the University of Pittsburgh of the Center for the Study of Learning. The material presented in this paper is not necessarily endorsed by any of these organizations. Requests for reprints should be sent to Dr. James F. Voss, 634 LRDC, 3939 O'Hara St., University of Pittsburgh, Pittsburgh, PA 15260, USA.